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Caltrans Division of Research,
Innovation and System Information

Research Results

Seismic

NOVEMBER 2015

Project Title:
ShakeCast V3—An Enhanced Tool for
Post-Earthquake Response

Task Number: 1793

Start Date: March 30, 2011

Completion Date: December 31, 2014

Product Category: New or improved
decision support tool, simulation, model,
or algorithm (software)

Task Manager:
Loren Turner
Senior Transportation Engineer
loren.turner@dot.ca.gov

Enhancing ShakeCast to Improve Post-Earthquake Response

ShakeCast V3 provides bridge inspection prioritization information to responders within minutes following an earthquake

WHAT WAS THE NEED?

After a major earthquake, one of Caltrans's most critical tasks is to determine the condition of bridges and roadway corridors in the region. Timely response is important to ensure public safety, guide emergency vehicle traffic, and re-establish critical lifeline routes. In the past, identifying the structures that needed to be assessed could take hours, delaying inspection teams from getting to work. In 2005, Caltrans worked with the United States Geological Survey (USGS) to develop ShakeCast, a software tool that evaluates the ground shaking at a facility site with unique vulnerability thresholds established for that facility for earthquakes greater than magnitude 4.0. Within 10 minutes of the event, ShakeCast sends a list of facilities sorted by inspection priority to the designated Caltrans responders.

As technology continues to evolve, it's important to keep ShakeCast current and expand its features to deliver improved and tailored bridge, building, and roadway status information to emergency responders.

New ShakeCast V3 web interface
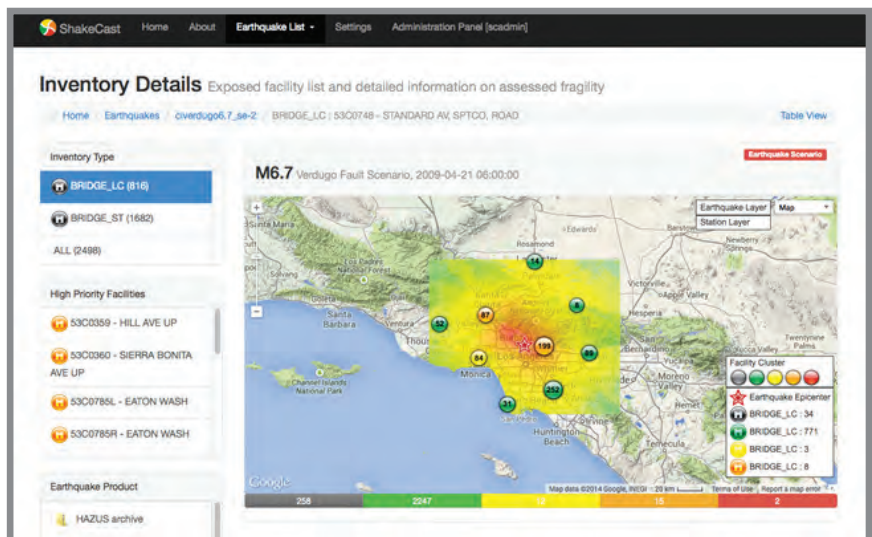
Caltrans provides a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability.

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WHAT WAS OUR GOAL?

The goal was to develop an enhanced version of ShakeCast to accommodate a broader range of facility types and disseminate more informative and accurate messages to Caltrans responders.

WHAT DID WE DO?

Caltrans, in partnership with USGS, enhanced ShakeCast to meet transportation-focused needs. The requirements included:

- Full statistical interpretation of facility fragility models in analysis and reporting
- Component-based fragility analysis framework
- Information regarding landslide and liquefaction hazards
- Analysis of multiple facility types on a single system
- More accurate representation and analysis of facilities in maps as multidimensional objects rather than just points

During development, the team tested about 13,000 state bridges, 12,900 local bridges, 380 maintenance buildings, and numerous landslide prone roadway corridors.

WHAT WAS THE OUTCOME?

ShakeCast v3 is more robust and expands the scope of situational awareness by assessing more types of facilities, implementing more rigorous vulnerability functions, and enhancing the delivery of information and products through a revised web application interface.
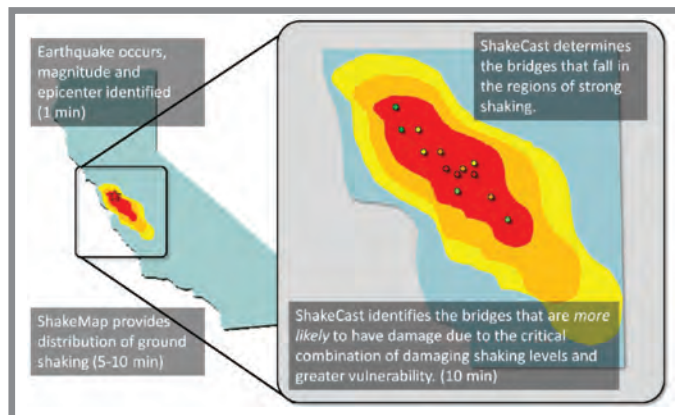
WHAT IS THE BENEFIT?

By focusing inspection efforts on the most damage-susceptible infrastructure, ShakeCast v3 helps Caltrans responders make informed decisions and take quick action to ensure safety, restore system functionality, and minimize losses. This awareness improves communication within Caltrans and between agencies. A faster, better coordinated, and more effective emergency response helps save lives and facilitate a rapid restoration of network functionality and traveler mobility. Other public service organizations, such as the Los Angeles Unified School District and BART, have also learned from and adopted ShakeCast products piloted under Caltrans's initiative.
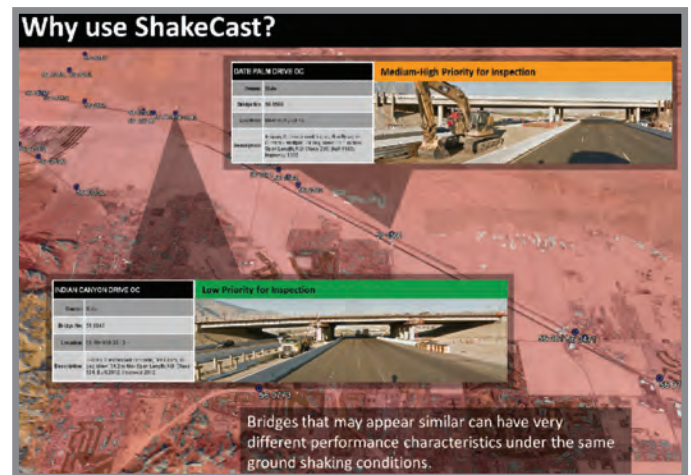
LEARN MORE

To view the complete report:
www.dot.ca.gov/newtech/researchreports/reports/2014/ final_report_task_1793.pdf

ShakeCast identifies bridges within zones of strong shaking that are more likely to have sustained damage.

Sequence of ShakeCast analysis steps